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THE U. P. A. S. I.

(INCORPORATED.)

Contents.

We reproduce from the "Indian Planters' Gazette and Sporting News," a short account of the gathering of wild rubber in South America. Colonel Fawcitt describes it as "brutalizing." It must be seen to be believed, for no such experience can be compared with it in India, where the coolie labour has been invariably well treated and well looked after from the days of the Pioneers in all our Agricultural Industries.

The Gold Coast are taking the wise precaution of insisting on cocoa and rubber plants and seeds being disinfected before landing. Next year we all hope that the Pest Act on the same lines will be in force in India.

The opening address by Professor T. B. Wood on Agriculture before the British Association at Birmingham is of such general interest to all that we make no excuse for publishing it can only regret that space prevents us giving our readers the whole of it. Great as are the strides that have been made in recent years in Scientific Agriculture, it is marvellous that these results should be the outcome of practically only twenty-five years. Agriculture is a restless Science, and we may expect new methods tending to the increased fertility of our soils from scientific research. Next week we hope to complete this very valuable address.

We also publish from the "Board of Trade" Journal the exports of Rubber from Brazil, Peru and Bolivia.

Mr. Barnard's letter on the Labour Question will doubtless receive the attention due to it from the Labour Committee, and prove a distinct help in framing some laws for the better supervision of maitries. The form attached appears capable of improvement but it is a valuable suggestion.

Mr. Rutherford has written a most interesting report of his experiences with Green Bug and his method of attacking and checking it. It contains suggestions on the method of spraying of the highest practical use and is bound to be appreciated by all planters; and we hope that others will follow in his footsteps, as suggested by Mr. Anstead. Not only in regard to Green Bug, but "many other problems." We draw particular attention to the Planting Expert's letter, and emphasize his word of warning.

RUBBER.

The tragedy of wild rubber gathering is graphically described in the November number of the *Contemporary Review* by Mr. John H. Harris. "The natives may tramp through the forest for days; provisions may run short or go bad, and the workers must sleep in rude shelters composed of a few palm branches and twigs, which are a poor protection from tropical tornadoes. Whilst searching for rubber the unclothed natives suffer terribly from those tropical rains. I have seen them many a time almost convulsed with rigours as the pitiless cold rain has poured down on their naked or half-clad bodies. In utterable misery, with chattering teeth and countenances livid with cold, they pluck wildly at pieces of bark or forest leaves in the hope of obtaining some shelter, if only for the head. Fever frequently follows, and then, too often, further tornadoes, the fording of a swamp or heavy cold dews exact the final penalty; and the rubber gatherer has gone to those Elysian fields of which he dreams—where rubber does not grow." The writer quotes Colonial Fawcett's letter to *The Times* last year, in which the Indians searching for rubber in the upper reaches in the Amazon is thus described: "I have seen batches of Indians covered by 'sekiti,' a species of leprosy, or lying in rows in flimsy sheds, too weak from fever to get about, piling up debt, which has to be expunged in rubber. Nobody seems to care. The whole business is brutalising."

By way of contrast to the condition of the unfortunate creatures engaged in the collection of wild rubber in some parts of South America a statement as to labour conditions on rubber plantations recently issued by the Agent of the Federated Malay States is quite cheerful reading. On estates of over 100 acres the total number employed in the Federated Malay States in 1912 was 188,030, an increase of 22,000 over 1911. Wages for Tamil men ranged from 7d. to 1s. 10d. per day, for Javanese from 9d. to 1s. 6d. per day and Chinese from 11d. to 2s. 4d. per day. It must be understood, however, that housing accommodation and medical attendance are provided by the employers. Official reports show that the labourers are able to save considerable sums of money out of their wages. The amount remitted by money order from the Federated Malay States to India increased from Rs.3,403,00 in 1911 to Rs.4,293,646 in 1912, and the amount to the credit of Indians in the Savings Bank was £53,890 of which about £16,350 is said to have been deposited by labourers.—*Indian Planters' Gazette and Sporting News*.

GOLD COAST.

IMPORTATION OF COCOA AND RUBBER PLANTS AND SEEDS.

The Board of Trade are in receipt of an Order-in-Council dated 21st July, 1913 which was made by the Governor in Council under the "Destructive Pests Ordinance, 1912" and which notifies that it shall not be lawful for any person to import into the Gold Coast Colony any Cocoa or Rubber plants or seeds into this Colony, except through the Ports of Accra and Seccondree.

All such cocoa or rubber plants or seeds must be disinfected before shipment in a manner approved by the Director of Agriculture, and accompanied by a certificate to the effect that such disinfection has been duly and properly carried out; otherwise they will be destroyed, or landed at such place as the Director of Agriculture may direct for disinfection under the supervision at the expense of the Importer.—*Board of Trade Journal*.

THE BRITISH ASSOCIATION AT BIRMINGHAM.**SECTION M.
Agriculture.***Opening Address by Prof. T. B. Wood, President of the Section.*

I propose to follow the example of my predecessor of last year, in that the remarks I wish to make to-day have to deal with the history of agriculture. Unlike Mr. Middleton, however, whose survey of the subject went back almost to prehistoric times, I propose to confine myself to the last quarter of a century—a period which covers what I may perhaps be permitted to call the revival of agricultural science.

Twenty-five years ago institutions concerned with the teaching of agriculture or the investigation of agricultural problems were few and far between. I do not propose to waste time in giving an exhaustive list, nor would such a list help me in developing the argument I wish to lay before the section. It will serve my purpose to mention that organised instruction in agriculture and the allied sciences was already at that date being given at the University of Edinburgh and at the Royal Agricultural College, whilst, in addition, one or more old endowments at other universities provided courses of lectures from time to time on subjects related to rural economy. Agricultural research had been in progress for fifty years at the Rothamsted Experimental Station, where the work of Lawes and Gilbert had settled for all time the fundamental principles of crop production. Investigations of a more practical nature had also been commenced by the leading agricultural societies and by more than one private landowner.

In these few sentences I have endeavoured to give a rough, but for my purpose sufficient, outline of the facilities for the study of agricultural science twenty-five years ago, at the time when the county councils were created. Their creation was followed almost immediately by what can only be called a stroke of luck for agriculture. The Chancellor of the Exchequer found himself with a considerable sum of money at his disposal, and this was voted by Parliament to the newly created county councils for the provision of technical instruction in agriculture and other industries.

Farmers were at that time struggling with the bad times following the wet seasons and low prices of the 'seventies and eighties' and some of the technical instruction grant was devoted to their assistance by the county councils, who provided technical instruction in agriculture. Thus, for the first time, considerable sums provided by the Government were available for the furtherance of agricultural science; and, although at first there was no general plan of working and every county was a law unto itself, the result has been a great increase of facilities for agricultural education and research.

Almost every county has taken some part. The larger and richer counties have founded agricultural institutions of their own. In some cases groups of counties have joined together and federated themselves with established teaching institutions. For my purpose it suffices to state, without going into detail, that in practically every county, in one way or other, attempts have been made to carry out investigations of problems related to agriculture.

Twenty years after the voting of the technical instruction grant to the county councils, Parliament has again subsidised agriculture in the shape of the Development Fund, by means of which large sums of money have

been devoted to what may be broadly called agricultural science. It seems to me that the advent of this second subsidy is an occasion when this section may well pause to take stock of the results which have been achieved by the expenditure of the technical education grant. I do not propose to discuss the results achieved in the way of education, although most of the technical instruction grant has been spent in that direction. It will be more to the point in addressing the Agricultural Section to discuss the results obtained by research.

The subject, then, of my address is the result of the last twenty years of agricultural research, and I propose to discuss both successes and failures, in the hope of arriving at conclusions which may be of use in the future.

Agricultural science embraces a variety of subjects. I propose to consider first the results which have been obtained by the numerous practical field experiments which have been carried out in almost every county. I suppose that the most striking result of these during the last twenty years is the demonstration that in certain cases phosphates are capable of making a very great increase in the crop of hay, and a still greater increase in the feeding value of pastures. This increase is not yielded in all cases, but the subject has been widely investigated, and the advisory staffs of the colleges are in a position to give inquirers trustworthy information as to the probability of success in almost any case which may be submitted to them. This is a satisfactory state of things, and the question naturally arises: How has it come about?

On looking through the figures of the numerous reports which have been published on this subject, it appears at once that in many cases the increase in live-weight of sheep fed on plots manured with a suitable dressing of phosphate has been twice as great as the increase in weight of similar animals fed on plots to which phosphate has not been applied. Now about a difference of this magnitude between two plots there can be no mistake. It has been shown by more than one experimenter that two plots treated similarly in every way are as likely as not to differ in production from their mean by 5 per cent. of their produce, and this may be taken as the probable error of a single plot. Where, as in the case of many of the phosphate experiments, a difference of 100 per cent. is recorded, a difference of twenty times the probable error, the chances amount to a certainty that the difference is not an accidental variation, but a real effect of the different treatment of the two plots. The single-plot method of conducting field trials, which is the one most commonly used, is evidently a satisfactory method of measuring the effects of manures which are capable of producing 100 per cent. increases. It was good enough to demonstrate with certainty the effects of phosphatic manuring on many kinds of grass land, and it is to this fact that we owe one of the most notable achievements of agricultural science in recent years.

Another notable achievement is the discovery that in the case of most of the large-cropping varieties in potatoes the use of seed from certain districts in Scotland or the northern counties of Ireland is profitable. This is another instance of an increase large enough to be measured accurately by the single-plot method. Reports on the subject show that seed brought recently from Scotland or Ireland gives increased yields of from 30 to 50 per cent. over the yields produced by seed grown locally for three or more years.

That the single-plot method fails to give definite results in many cases where it has been used for manurial trials is a matter of common knowledge. Half the reports of such trials consist of explanations of the discrepancies between the results obtained and the results which ought to have been obtained. The moral is obvious. The single-plot method, which suffices to demonstrate results as striking as those given by phosphates on some kinds of pasture land, signally fails when the subject of investigation is concerned with differences of 10 per cent. or thereabouts.

Before suggesting a remedy for this state of things it will be well to consider the allied subject of variety testing, which has been brought into great prominence recently by the introduction of new varieties of many kinds of farm crops. In testing a new variety it is necessary to measure two properties—its quality and its yielding capacity—for money-return per acre is obviously determined by the product of yielding capacity and quality as expressed by market price. I propose here to deal only with the determination of yielding capacity. The determination of quality is not allied to manurial trials.

In attempting to determine yielding capacity there has always been a strong temptation to rely on the measurement of obvious structural characters. For instance, in the case of cereals many farmers like large ears, no doubt with the idea that they are an indication of high-yielding capacity. Many very elaborate series of selections have been carried out, on the assumption that large grains, or large ears, or many ears per plant implied high yield.

We may take it as definitely settled that none of these characters is trustworthy, and that the determination of yielding capacity resolves itself into the measurement of the yield given by a definite area. The actual measurement, therefore, is the same as that made in manurial trials, and is, of course, subject to the same probable error of about 5 per cent.

It follows, therefore, that it is subject to the same limitations. Variety trials on single plots, and that is the method commonly used, will serve to measure variations in yielding capacity of 30 per cent. or more, but are totally inadequate to distinguish between varieties the yielding capacities of which are within 10 per cent. of each other.

Numbers of such single-plot trials have been carried out, with the result that many varieties with yielding capacities much below normal have almost disappeared from cultivation, and those commonly grown do not differ greatly from one another—probably not more than 10 per cent.

Ten per cent. in yielding capacity, however, in cereals means a return of something like 15s. to 20s. per acre—a sum which may make the difference between profit and loss; and if progress is to be made in manuring and variety testing, some method must be adopted which is capable of measuring accurately differences in yield per unit area of the order of 10 per cent.

The only way of decreasing the probable error is to increase the number of plots, and to arrange them so that plots between which direct comparison is necessary are placed side by side, so as to reduce as much as possible variations due to differences in soil. Thus it has been shown that with ten plots in five pairs the probable error on the average can be reduced to about 1 per cent., in which case a difference of from 5 to 10 per cent. can be measured with considerable certainty.

Such a method involves, of course, a great deal of trouble; but agricultural science has now reached that stage of development at which the obvious facts which can be demonstrated without considerable effort have been demonstrated, and further knowledge can only be acquired by the expenditure of continually increasing effort. In fact, the law of diminishing return holds here, as elsewhere.

It appears, then, that for questions involving measurements of yield per unit area, such, for instance, as manurial or variety trials, further advance is not likely to be made without the expenditure of much more care than has been given to such work in the past. The question naturally arises: Is it worth while? I think the following instance shows that it is:—

Some years ago an extensive series of variety trials was carried out in Norfolk, in which several of the more popular varieties of barley were grown side by side at several stations for several seasons. In all, the trial was repeated eleven times. As a final result it was found that Archer's stiff-straw barley gave 10 per cent. greater yield than any other variety included in the trials, and by repetition of the experiment the probable error was reduced to $1\frac{1}{2}$ per cent. The greater yield of 10 per cent., being over six times the probable error of the experiment, indicates practical certainty that Archer barley may be relied on to give a larger crop than any of the other varieties with which it was compared. One difficulty still remained. It was almost impossible to obtain anything like a pure strain of Archer barley. Samples of Archer sold for seed commonly contained 25 per cent. of other varieties. This difficulty was removed by Mr. Heaven, who selected, again with enormous trouble, a pure high-yielding strain of Archer barley. Since this strain was introduced into the Eastern Counties the demand for it has always exceeded the supply which could be grown at Cambridge and at the Norfolk Agricultural Station, and it is regarded by farmers generally as a very great success.

The conclusion, therefore, is that a 10 per cent. difference is well worth measuring, that it cannot be measured with certainty by the single-plot method, and that it behoves those of us who are concerned with field trials to look to our methods, and to avoid printing figures for single-plot experiments which may very well be misleading. Almost everyone thinks himself competent to criticise the farmer, who is commonly described as too self-satisfied to acquaint himself with new discoveries, and too conservative to try them when they are brought to his notice. Let us examine the real facts of the case. Does the farmer ignore new discoveries? The largely increasing practice of consulting the staffs of the agricultural colleges, which has arisen among farmers during the last few years, conclusively shows that he does not; that he is, in fact, perfectly ready to avail himself of sound advice whenever he can. Is he too conservative to try new discoveries when brought to his notice? The extraordinary demand for seed of the new Archer barley quoted above, and for seed of new varieties generally, the continuous advance in the prices of phosphatic manures, as the result of increased demand by farmers, the trade in Scotch and Irish seed potatoes, all show how ready the farmer is to try new things. The chief danger seems to be that he tries new things simply because they are new, and he may be disappointed if those who are responsible for the new things in question have not taken pains to ascertain with certainty that they are not only new but good. Farmers are now-a-days in what may be called a very receptive condition. Witness the avidity with which they paid extravagant prices for single tubers of so-called new, but inadequately tested,

varieties of potatoes some years ago, and in a less degree the extraordinary demand for seed of the much-boomed French wheats, and the excitement about nitrogen for soil or seed inoculation. Witness, too, the almost universal failure of the new potatoes and French wheats introduced during the boom, and the few cases in which nitrogen gave any appreciable result. The farmer who was disappointed with his ten-guinea tuber, his expensive French wheat, or his culture of nitrogen cannot but be disillusioned. Once bitten, twice shy. He does not readily take advice again.

Let us, therefore, recognise that the farmers of the country are ready to listen to us, and to try our recommendations, and let that very fact bring home to us a sense of our responsibility. All that is new is not therefore, necessarily good. Before we recommend a new thing let us take pains to assure ourselves of its goodness. To do so we must find not only that the new thing produces a greater return per acre, but that the increased return is worth more than it costs to produce, and we must also define the area or the type of soil to which this result is applicable. This implies in practice that each field trial should confine itself to the investigation of only one, or, at most, two, definite points, since five pairs of plots will be required to settle each point; that the experimental results should be reviewed in the light of a thorough knowledge of farm book-keeping, and that accurate notes should be taken of the type of the soil, and the area to which it extends, and of the various meteorological factors which make up the local climate. At present we are not in possession of a sufficient knowledge of farm accountancy, but there is hope that this deficiency will be removed by the work of the Institute for Research in Agricultural Economics, which has recently been founded at Oxford by the Board of Agriculture and the Development Commission. The excellent example set by Hall and Russell in their "Survey of the Soils and Agriculture of the South-Eastern Counties," an example which is being followed in Cambridge and elsewhere, seems likely to result in the near future in a complete survey of the soils of England which will make a sound scientific basis for delimiting the areas over which the results of manurial or variety trials are applicable.

Reviewing this branch of agricultural science, the outlook is distinctly hopeful. New fertilisers are coming into the market as, for instance, the various products made from atmospheric nitrogen. New varieties of farm crops are being produced by the Plant-breeding Institute at Cambridge, and elsewhere. It is to be hoped that the work of the Agricultural Economics Institute at Oxford will throw new light on the interpretation of experimental results from the accountancy standpoint. Finally, the soil surveys on which the colleges have seriously embarked will assist in defining the areas over which such results are applicable. It only remains for those of us who are responsible for the conduct of field trials to increase the accuracy of our results, and the steady accumulation of a mass of systematic and scientific knowledge is assured. It will be the business of the advisory staffs with which the colleges have recently been equipped by the Board of Agriculture and the Development Commission to disseminate this knowledge in practicable form to the farmers of this country.

One more point, and I have finished this section of my address. I have perhaps inveighed rather strongly against the publication of the results of single-plot trials. I quite recognise that the publication of such results was to a great extent forced upon those experimenters who were financed by annually renewed grants of public money. Now-a-days, however, agricultural science is in a stronger position, and I venture to hope that most public authorities which subsidise such work are sufficiently alive to the evils attend-

ant on the publication of inconclusive results to agree to continue their grants for such periods as may suffice for the complete working out of the problem under investigation, and to allow the final conclusions to be published in some properly accredited agricultural journal, where they would be readily and permanently available to all concerned. This would in no wise prevent their subsequent incorporation in bulletins specially written for the use of the practical farmer.

So far I have confined my remarks to subjects of which I presume that every member of the section has practical experience, subjects which depend on the measurement of the yield per unit area. These subjects, however, although they have received far more general attention than anything else, by no means comprise the whole of agricultural science. Certain scientific workers have confined their efforts to the thorough solution of specific and circumscribed problems. I propose now to ask the section to direct its attention to some typical results which has been thus achieved during the last twenty years.

The first of these is the development of what I may call soil science. Twenty years ago the bacteriology of nitrification had just been worked out by Warrington and by Winogradski. The phenomena of ammoniacal fermentation of organic matter in the soil were also fairly well established. The fixation of atmospheric nitrogen by organisms symbiotic on the leguminosae had been definitely demonstrated. Fixation of nitrogen by free-living organisms had been suggested, but was still strenuously denied by most soil investigators. No suggestion had yet been made of the presence in normal soils of any factor which inhibited crop production. The last twenty years have seen a wonderful advance in soil science. Our knowledge of nitrification and ammoniacal fermentation has been much extended. The part played by the nodule organisms of the leguminosae has been well worked out, has seen a newspaper boom, and a subsequent collapse, from which it has not yet recovered. But the greatest advance has been the discovery of the part played by protozoa in the inhibition of fertility.—*Nature*.

(To be Continued.)

BRAZIL. PERU. BOLIVIA.

EXPORTS OF RUBBER FROM THE AMAZON BASIN, *via* PARA, IN SEPTEMBER, 1913

H. M. Consul at Para (Mr. G. B. Michell) reports that the quantity of rubber exported from Para, Manaus, Inquitos, and Itacoatiara during the month of September, 1912 and 1913, was as follows:—

	Fine.	Medium.	Coarse.	Caucho.	Total.
September 1912— Kilogs.	Kilogs.	Kilogs.	Kilogs.	Kilogs.	Kilogs.
To United States...	342,737	116,300	453,169	129,404	124,1610
To Europe	824,822	126,816	144,443	173,694	126,9475
Total...	1,367,559	243,116	597,312	303,098	251,1085
September 1913—					
To United States...	620,311	173,489	326,228	181,695	130,1723
To Europe	857,141	76,763	160,191	243,711	134,7812
Total...	1,487,452	250,258	486,416	425,409	264,9535

Kilogs. 2.2016 lbs.—*The Board of Trade Journal*.

CORRESPONDENCE

Munderi Estate, 4th December, 1913.
The Labour Commission.

THE EDITOR,

The Planters' Chronicle,

Bangalore.

Dear Sir,—In regard to the scope of the Labour Commission as detailed by Mr. Nicolls in your issue No. 44, I think item 4 regarding "supervision of maistries" requires some amplification.

To effectually supervise maistries a scheme somewhat on the following lines appears necessary and I do not see any insuperable difficulties in its accomplishment.

Imprimis. All Estate Superintendents who are members of the Commission should be called upon to submit a list of maistries employed on their estates at the time, and also a list of all maistries whose names appear in the Check Roll for the last two years or any other suitable period. This might be done in the form enclosed giving the particulars shown in the headings. These lists when collected should be compared and a complete register of maistries, past and present, drawn up. Copies of the Register should be supplied to each Asst. Commissioner who should make it part of his duties to personally see the maistries noted as working on Estates in his section and further the accuracy of each Estate Superintendent's information should be checked by the Commission's native staff. In this manner all "good" maistries could be identified and rascals who are under advance to more than one Estate discovered. The Commission could then afford to take the risk of guaranteeing the "good" maistries and by paying particular attention to coolies of such maistries in respect to items 1, 2, and 3 of Mr. Nicoll's letter can bring home to *all* maistries the desirability of being registered by the Commission.

Yours faithfully,

N. A. S. BARNARD.

Name.	Personal appearance. Height, age, &c.	Period working on estate.	Average amount of periodical advances.	Average Daily gang of coolies.	Supt's Opinion.	Asst. Commr's Remarks.

Siklasapur.

Green Bug in Mysore.

THE EDITOR,

The Planters' Chronicle,

Bangalore.

Dear Sir,—One now sees very little correspondence *re.* above pest and as the season is on as when it may be likely to crop up in parts of districts

where so far it is unknown; I think that your readers may find of interest the experiences of one who has just gone through an attack and had a big area infected.

At the beginning of outbreak in April last, I had no Sprayers and so to try and keep outbreak in hand I had big gangs on removing all wood on which bug could be found; putting this wood into sacks on spot and then burning it. Though this work at time was then approved, I am now of opinion that with a product like coffee it was wrong; and that I should have done better to have waited for Sprayers and in the meantime confined my attention to removing ants' nests instead, as they were spreading the scale. In the case of a single tree it might be of use to remove all wood on which pest is, but even then it stands to reason that there must be a lot of Scale which is not visible to the eye, and so is only wasting good material with no benefit. I should advise anyone who has only just had his estate infected, to spray only taking care to spray not only the trees attacked but also several trees all round them, and not to remove any wood except perhaps to prune trees out, so that spray can get at them better. In an infected estate, if one finds a lot of either the Red. or small Black ants on trees, the chances are that Scale is present also.

Coffee is not an easy tree to spray, and it was with this work that I found a lot of difficulty from a planter's point of view, especially if area infected is big, as one has to do work as cheap as possible and yet it must be thorough to be of any use. I found it as well to teach coolies to use sprayers with only water in them at first, as it is not at all an easy matter to get them to understand. Any one can pump stuff out of sprayer, but not only is this in my opinion useless, but also very expensive. What one wants is that pressure is first got up well behind spray, and then emulsion will be thrown well into tree, if the nozzle of the sprayer is not held too near the part to be sprayed. These two facts are hard to teach, but they make all the difference, both in the way the pest is killed, and also in the amount of fluid used. A man who gets good pressure behind spray and holds his nozzle well off from the part being sprayed, will cover twice the area of a man who simply pumps the stuff on and holds his nozzle right up, and what is more the latter's work, though the tree will be soaked, will not kill like the former's, as it does not get at the bug in the same way. I found that a gang of sprayers, if working well, could be seen quite a distance off by a fine mist over trees, whereas if the pressure was not being kept up, or the nozzle was not being held right, one did not see this.

I used as fluid in sprayers, Rosin 1, Washing Soda 1, Navy Bar Soap 1, to 4 gallons of water. The above kills well, and I should not advise anyone at first outbreak to try any experiments with any other, till they have got the whip hand. But the above is very strong, and I found that as soon as I had got a whip hand, that an emulsion made up with half the amount of Soda did well, and also there is a doubt in my mind as to whether the Soap is necessary at all? Anyway I should strongly advise any one to use the best soap only, as I found in one instance when I had to use a cheap soap, for about a week, that the whole of my gang got bad eyes from the irritation of it, and I myself was none too happy. I found here that when a big area has to be sprayed it is better to make a man work up one side and down the other of each row, going backwards the whole time, thus not only does he not have to pass through trees already done; but if also has the advantage of his not spraying a fellow worker as is the case if two men are working on the same row.

In making the solution I found that there was no need to reduce the Rosin to a fine powder, but if one smashed it up into small lumps it was quite sufficient and labour is thus saved when one is making a big quantity.

I found a big native sugar boiler a grand thing to make a quantity in, as one can then put in say 50 lbs. of each ingredient and sufficient water to make a stock solution, each gallon of which will when added to a kerosene tin of water make 4 gallons of fluid for spraying. In this way one has very little to carry in estate, except water, as a little solution goes a long way. An old petrol tin is a very useful thing to carry the stuff about the estate in.

During the main outbreak I used the Eclair No. 1 Sprayer with a double nozzle and found it very satisfactory, but it is difficult to keep the pressure up, and also after continual wear, it wants a lot of adjusting. I have also tried "Four Oaks" and Holder Pressure Sprayers. The latter I think are ideal, but they will want a lot of looking after, or they will not stand much wear. I am however glad to say since the latter sprayers arrived I have had not much use for them, as at present the trees on this estate seem to be free from scale, and the only place one finds any, is in ants' nest where it has been harboured by them.

The Fungus that attacks the "Green Bug" appeared early in the rains, and was most satisfactory, especially on the Sprayed area. On some trees it did not appear at all till almost the end of rains. I however found that if one carried some fungus infected branches to these latter trees that one could very soon in this way get Fungus to breed on them also.

I expect however that our Assistant Scientific Officer, now that this pest has been with us for quite a while, will have been able to collect a lot of data which will be of use to estates who have the Pest, as though we have a knowledge of one way of keeping it in hand still I conclude with the opportunity he has had of studying the present outbreak, he will be able to soon tell us something more of its life history, and the influence different works such as tillage and manures, may have on combating pest. I believe that I am right in saying that one is now working rather in the dark as regards this scale, and that it is not improbable if more was known about its life and movements during the period when climatic conditions are not favourable for breeding; especially in relation to the coffee tree; one might be in a better position to tackle it. With us in Mysore where Coffee is the staple product, the more we can know about this pest the better, as I believe I am right in saying that so far the scale has been found on no other product in the Coffee districts in Mysore, and that the reports that it exists on the native crops in the open country, have still to be proved. I think the Green Bug (*Lecanium Viride*) is being confused with the young of another kind, which it is very like, and which I know has been in most parts for years. One often finds the suckers of a jungle stump covered with the young of this other species; and it is likely to give one a shock if they do not know how to distinguish between the two—especially if found in a Coffee Estate.

Yours faithfully,

E. W. R.

No. 1010/1913.

Office of the Planting Expert,

Bangalore,

5th December, 1913.

THE EDITOR,

The Planters' Chronicle,

Bangalore.

Dear Sir,—E. W. R.'s interesting letter is most welcome, would that others would follow his example and give us the benefit of their practical experiences with Green Bug and many other problems.

At the beginning of the outbreak last April it was fondly hoped that it was purely sporadic and so E. W. R. and others were advised by the Scientific Department to use drastic measures with the idea of stamping it out once for all. Moreover there were no sprayers on estates despite frequent warnings given in former years that the pest would one day make its appearance and that all estates should keep sprayers and spraying material ready as an insurance. To wait for sprayers to come from Europe appeared futile and hence the need for drastic pruning methods. With sprayers in hand, and I trust that now there is no estate in South Mysore without them (I wonder if this is really the case?) I agree with E. W. R. that spraying is the best thing to do.

E. W. R. tells us how to spray, and our thanks are due to him for his most valuable practical hints. As to the mixture I believe it the best. Of course there are lots of other mixtures which will kill scales more or less, but personally I believe this to be the best. It can as E. W. R. says be made weaker once the scale is got in hand, but I think the soap is necessary.

With regard to sprayers, an Auto-spray type is the best as it avoids the necessity of pumping and automatically keeps up a big pressure behind the spray which E. W. R. finds so necessary. The Holder is a good type but expensive and the Honorary Secretary of the Council of the Mysore Planters' Associations has been put in possession of price lists and details of several other equally efficient and cheaper Auto-sprayers. The Scientific Assistant who gave him his information can also help in this matter.

The fungus no doubt under favourable climatic conditions does a lot of good, but it will not grow in dry weather. It should certainly be spread when it makes its appearance by tying fungus infected branches into trees not yet infected.

There must also, I think, be an organised campaign against Ants though these will be difficult to exterminate.

Trees which have been attacked by Scale though saved by spraying will undoubtedly be weakened and they should be manured accordingly. In fact as I have often said to resist the attack of this or any other pest the trees should be maintained at the highest pitch of vigour and health.

The young of *Lecanium viride* is easily confused with that of *Pulvinaria psidii*, the Mealy Bug, and planters should endeavour to distinguish between these scales.

As E. W. R. says there is a lot still to be learned about this pest. In the monsoon it will be found sheltered in ants' nests chiefly and it is undoubtedly carried over periods unfavourable to it largely by the aid of Ants.

In conclusion let me once more remind and warn planters that there will probably be a big general outbreak of this pest in the early months of January. It should be watched for most carefully and tackled directly it appears. Once more is there anyone who has not got his sprayers, soda, soap, &c., anyone who has not made every precaution to fight this pest, anyone who does not know it when he sees it? If so let him at once take the necessary precautions and remember that he is a danger to the whole planting community if he is going to neglect the pest and allow his estate to become a nursery from which it can spread to his neighbours. It is to deal with such that a Pest Act is necessary, but I firmly hope there are no planters so selfish and careless in South Mysore.

Yours faithfully,

RUDOLPH D. ANSTAD,

Planting Expt. rt.